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THE AIR FORCE PHYSICAL FITNESS PROGRAM  
IS IT ADEQUATE?

by

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## *Contents*

|  | <i>Page</i> |
|--|-------------|
| DISCLAIMER .....   | II          |
| TABLES .....   | V           |
| PREFACE .....  | VI          |
| ABSTRACT .....   | VII         |
| INTRODUCTION .....   | 1           |
| WHAT IS PHYSICAL FITNESS? .....                            | 3           |
| Cardiorespiratory (Aerobic) Fitness .....                  | 3           |
| Muscular Fitness .....                                     | 4           |
| Flexibility .....  | 4           |
| Body Composition .....                                     | 4           |
| BENEFITS OF PHYSICAL FITNESS .....                         | 6           |
| Cardiorespiratory (Aerobic) Training .....                 | 6           |
| Strength-Training .....                                    | 8           |
| Flexibility Training .....                                 | 11          |
| HISTORY OF THE US AIR FORCE PHYSICAL FITNESS PROGRAM ..... | 14          |
| SHORTCOMINGS OF THE PROGRAM .....                          | 17          |
| Overemphasis on Aerobics .....                             | 17          |
| Low Aerobic Standards .....                                | 19          |
| A Test, Not a Program .....                                | 21          |
| No Mandatory Participation .....                           | 22          |
| Predictable Testing .....                                  | 22          |
| Pass Fail Scoring .....                                    | 23          |
| Conclusion .....   | 23          |
| SUGGESTIONS FOR A NEW AND IMPROVED PROGRAM .....           | 25          |
| The Physical Fitness Training Program .....                | 25          |
| The Physical Fitness Testing Program .....                 | 28          |
| CONCLUSION .....   | 32          |

BIBLIOGRAPHY .....33

## ***Tables***

|   | <i>Page</i> |
|---|-------------|
| Table 1 Air Force Fitness Standards .....   | 19          |
| Table 2 Norms for VO <sub>2</sub> Max (Astrand and Rhyming) .....                 | 20          |
| Table 3 Cardiovascular Fitness Classifications (American Heart Association) ..... | 20          |
| Table 4 Norms for Muscular Strength and Endurance Testing .....                   | 29          |

## ***Preface***

Have you ever talked to a friend or co-worker from a sister service about the Air Force physical fitness test? Have you ever had to sit by while a Marine or Soldier made disparaging remarks about the lack of rigor in the Air Force physical fitness program? Have you ever wondered if maybe they were right? As an Air Force officer I have been in this situation quite a few times and I have wondered if maybe the Air Force program wasn't lacking. For that reason I have undertaken this research project to examine the methods by which the Air Force pursues physical fitness for its members and decide for myself if these methods are adequate.

I would like to acknowledge the help of my advisor Lt Col Joe Morris and the support of my wife and family. I could not have done this project without them.

***Abstract***

In this paper the author defines four components of physical fitness – muscular fitness, cardiorespiratory fitness, flexibility and body composition. Potential individual and organizational benefits of physical fitness are discussed. A brief history of military and the Air Force fitness programs from WW I to the present is given. The author uses this background information to assert that the Air Force physical fitness program has a number of shortcomings. The author then provides a framework for an improved program to meet the needs of the Air Force today and into the future.

## **Chapter 1**

### **Introduction**

Physical fitness has always been an important attribute of America's fighting forces. The image of a lean, strong, young man (or woman) in uniform is the image most Americans identify with their armed forces. This image is a natural one. Historically, to be an effective soldier one had to be ready for sustained physical exertions of various kinds. Some argue that members of today's Air Force do not need to be as physically fit as their Army predecessors. They say that modern technology has removed the requirement for physical fitness. This is not so.

Physical fitness is still required for several reasons. First, although modern technology has removed a large number of labor intensive tasks from the Air Force mission, many still remain. Some examples are the stress of pulling G forces in combat aircraft, the strength and endurance to escape and evade in a shoot down scenario, or the strength required by a fire fighter to remove victims during a crash rescue. Clearly physical attributes still play a role in the accomplishment of the Air Force mission. We need our troops to be physically fit.

The post-Cold War era has created a very different world in which the Air Force must operate. Gone are the days when forward basing allowed our airmen to operate from their "home field." Instead deployment and the physical rigors that come with it are



the order of the day. Today our deployed troops must be able to deal with such physical stresses as circadian dysrhythmia (jet lag), fatigue, environmental stress (heat, cold, etc.) and operations in chemically or biologically contaminated environments. Being physically fit better prepares them to function and even excel in these challenging environments.

Another fact of life for the Air Force of today is a shrinking budget for medical care. The Air Force is constantly searching for ways to reduce medical costs. The introduction of the Tri-Care system is an example of this search for less expensive healthcare. A logical way to reduce the overall cost of health care is to reduce the demand for it. Physical fitness can do that. Scientific evidence (which will be presented later) confirms the fact that a physically fit population requires less health care and therefore incurs less health care costs.

Given today's political, financial and strategic environment, physical fitness is clearly a vital issue for the United States Air Force. Both the individual and the organization benefit from a physically fit force. Before these benefits can be realized, we must first understand what physical fitness is and what components contribute to it.

## **Chapter 2**

### **What is Physical Fitness?**

Physical fitness has been defined as:

“The ability to carry out daily tasks with vigor and alertness, without undue fatigue and with ample energy to enjoy leisure-time pursuits and to meet unforeseen emergencies.”<sup>1</sup>

Experts in the field of sports physiology recognize that physical fitness is made up of four distinct components and that each of these components plays an important role in total physical fitness. These four components are cardiorespiratory fitness, muscular fitness, flexibility and body composition.<sup>2</sup>

#### **Cardiorespiratory (Aerobic) Fitness**

Cardiorespiratory fitness is the heart's ability to pump blood and deliver oxygen throughout the body.<sup>3</sup> It is the ability of the circulatory and respiratory systems to adjust to and recover from the effects of a whole-body workout. It gives one the ability to persist in strenuous tasks involving large muscle groups.<sup>4</sup> In layman's terms it is what most people would call “being in shape.” Good levels of cardiorespiratory fitness are associated with such feats as being able to run, bike, swim, cross country ski, etc. for extended periods of time without undue discomfort. The majority of studies done on physical fitness and exercise have concentrated on this type of exercise. Many of these studies and their results will be discussed in the next section.

## **Muscular Fitness**

The American College of Sports Medicine defines muscular fitness, as the strength and endurance of one's muscles.<sup>5</sup> Breaking the definition down further we find that muscular strength is defined as the maximal force that can be exerted against a resistance or the absolute maximum amount of force that can be generated in an isolated movement of a single muscle group.<sup>6</sup> In layman's terms this is the old "How much can you bench press?" scenario, where the subject attempts to perform one repetition with the most weight possible. The other half of muscular fitness is muscular endurance, which is defined as the ability of the muscles to apply a submaximal force repeatedly.<sup>7</sup> In other words this would be how many push-ups or sit-ups can you do or how many repetitions of a weight training exercise can you do with a given resistance.

## **Flexibility**

The third component of physical fitness is flexibility. This important and often neglected component is defined as the ability to move joints freely and without pain through a wide range of motion.<sup>8</sup> The average person would generally equate flexibility with the ability to perform splits or touch ones toe's without bending the knees. Approximately 80% of all low-back pain is associated with a lack of flexibility of muscles in that region.<sup>9</sup>

## **Body Composition**

The final component of physical fitness is body composition which is concerned with the relative amounts of fat and lean body tissue that make up the body mass. This body composition is usually expressed in a percentage of body fat measurement.<sup>10</sup> Most

Air Force personnel have become familiar with this concept since body fat measurement became part of the Air Force weight Management Program described in AFI 40-502.

Now that physical fitness has been defined and broken down into its components let's examine the benefits that each component brings to the individual and the organization.

### Notes

<sup>1</sup> David C. Nieman, *Sports Medicine Fitness Course* (Palo Alto, CA: Bull Publishing, 1986), 33.

<sup>2</sup> American College of Sports Medicine, *ACSM Fitness Book* (Champaign, IL: Leisure Press, 1992), 9.

<sup>3</sup> Ibid

<sup>4</sup> David C. Nieman, *Sports Medicine Fitness Course*, 35.

<sup>5</sup> American College of Sports Medicine, *ACSM Fitness Book*, 9.

<sup>6</sup> David C. Nieman, *Sports Medicine Fitness Course*, 36.

<sup>7</sup> Ibid.

<sup>8</sup> David C. Nieman, *Sports Medicine Fitness Course*, 36.

<sup>9</sup> Vivian H. Heyward, *Advanced Fitness Assessment and Exercise Prescription* (Champaign, IL: Burgess Publishing, 1991), 216.

<sup>10</sup> David C. Nieman, *Sports Medicine Fitness Course*, 36.

## **Chapter 3**

### **Benefits of Physical Fitness**

Physical fitness (and the exercise that leads to this fitness) carries with it many benefits. As you recall from the previous section, physical fitness can be broken down into four individual parts. Each of these parts is important and often carries with it a specific health enhancement. While a large portion of physical fitness studies has dealt with cardiorespiratory (aerobic) fitness, there are a smaller number of studies that clearly recognize the importance of the other components of fitness. More data from these less explored areas of study becomes available each year. First the benefits of aerobic exercise will be examined and then those of strength and flexibility training.

#### **Cardiorespiratory (Aerobic) Training**

There is convincing scientific proof that fitness and aerobic exercise can have a positive effect on the brain and specifically that exercise can help an individual better handle stress, depression and develop a better self-concept. Studies done by Dr Peter Seraganian and S.F. Siconofi demonstrate that individuals who participated in a 10-week exercise program handled mental stress better than those who did not participate in the exercise program. It is believed that adaptation to the physical stress of exercise makes for a better reaction to mental stress.<sup>1</sup>

Another study dealt with the effects of exercise on individuals with Type-A personalities. Many Air Force personnel can be described as having Type-A personalities. In general individuals with Type-A personalities lead a hectic, rushed lifestyle and can be described as aggressive, competitive and driven to prove themselves. The down side of possessing these personality traits is that it doubles one's chances of having a heart attack before age 65. A recent study demonstrated that middle-aged men placed on a 10-week exercise program showed a decrease in their Type-A behavior, thereby proving that the traits of this personality type and its associated ill effects can be controlled with regular exercise.<sup>2</sup>

Numerous studies have supported the fact that people feel better mentally when they participate in a regular exercise program. Studies conducted at Duke University, the University of California at Davis, University of Wisconsin and the University of San Francisco all found measurable improvement in the psychological function of subjects who exercised. These test subjects showed decreased levels of anxiety, depression, fatigue and confusion. Most individuals also reported feeling better following exercise sessions. Another study done at Bowling Green State University has also shown that exercise can help improve memory and cognitive function.<sup>3</sup>

The results from a National Institute of Mental Health Workshop held in 1984 go a long way in summarizing the mental benefits of regular exercise. They are as follows:

Physical fitness is positively associated with mental health and well being.

Exercise is associated with the reduction of stress emotions such as state anxiety.

Exercise has been associated with decreased levels of mild to moderate depression and anxiety.

Exercise results in reductions in various stress indices such as neuromuscular tension, resting heart rate and some stress hormones.<sup>4</sup>

Physical fitness and regular exercise have also been proven to combat cardiovascular disease by positively affecting two of the three major risk factors of heart disease (as described by the American Heart Association). These two factors are high blood pressure and poor blood cholesterol levels.<sup>5</sup> A study done at Stanford University showed that within a group of Harvard Alumni, those that did not exercise were 35% more likely to become hypertensive (develop high blood pressure) than those alumni that did exercise. Overall, studies suggest that regular exercise may reduce the risk of developing hypertension and that once developed, an exercise program can aid in the treatment and control of the ailment.<sup>6</sup>

The second risk factor to heart disease is hypercholesterolemia (high levels of cholesterol in the blood). Blood cholesterol comes in two forms, low density lipoproteins (LDL) and high density lipoproteins (HDL). A Framingham, Massachusetts study found that HDL levels were the best predictor of heart disease and that high levels of HDL were associated with a low risk of coronary disease.<sup>7</sup> Studies have found that regular endurance exercise is associated with higher levels of HDL. In fact burning 1,000 calories per week exercising can produce changes in HDL levels.<sup>8</sup>

## **Strength-Training**

Muscular strength and strength-training exercise can enhance an individual's overall fitness in a number of ways. The first and most obvious is that it increases the muscles' size, strength and endurance. This increased strength is useful in sports, as well as mission-related tasks. A related benefit of strength training is an improved appearance

and body composition. For example a 170-pound man with 20% body fat has 34 pounds of fat and 136 pounds of lean body mass. If that man begins a strength-training regime, he can replace 5 pounds of fat with 5 pounds of new muscle. He still weighs 170 pounds, but now has only 17% body fat and presents a firmer, more fit appearance.<sup>9</sup>

Including strength training in our total fitness program is important for another reason. Research has shown that without this training the average person will lose one-half pound of muscle every year of their life, beginning at age 25. This can have significant effects on the individual as he or she ages. A person could lose 20 pounds of muscle by age 65 and suffer from changes in their life in regards to mobility and activity. This loss of muscle also leads to a loss of basic metabolic rate (BMR). That means that a person's total caloric requirements continue to decline with the muscle mass and this can lead to fat gain and a change for the worse in body composition.<sup>10</sup>

Strength training can also reduce the risk of injury in two ways. First, well conditioned muscles can act as shock absorbers and lessen landing forces from activities such as walking or running. Secondly, strength training can lead to balanced muscle development, which decreases the risk of injury. A good example is the overdevelopment of the hamstrings from running. A strength program to develop the quadriceps could lessen the likelihood of an injury from running.<sup>11</sup>

Modern research has also found strength training can lead to improved health in a number of ways. The President's Council on Physical Fitness and Sports issued the following statement in December 1996,

"Adding ***strength-training*** to a program of regular physical activity will help to decrease the risk of 'chronic diseases' while improving quality of life and functionality, allowing people of all ages to improve and maintain their ***health*** and independent lifestyle."<sup>12</sup>



Research has found that strength training can positively affect such diseases as colon cancer, osteoporosis, and high cholesterol levels (which is a risk factor for heart disease).

A 1992 study at the University of Maryland found that a strength-training program accelerated the bowel transit time of men in the study by 56 %. Studies do suggest that populations with the highest rates of colon cancer also tend to have slow transit times. Ben F. Hurley, Ph.D., director of the exercise lab at the University of Maryland College of Health and Human Performance, who supervised the study said, "If slow transit time increases one's risk of colon cancer, then strength-training may be one way to reduce that risk factor."<sup>13</sup>

Osteoporosis affects 28 million Americans and 80% of those are women. Recent studies have clearly demonstrated that weight-bearing exercises can help to combat this disease. While exercises like walking and jogging are effective for the bones of the lower body, weight training is most effective for other parts of the body such as arms, shoulders, etc. In one study published in the Journal of the American Medical Association, female subjects who participated in a one-year program of strength-training not only saw a halt to the loss of bone mass, most saw significant increases in bone density. Another study conducted at Tufts University by exercise physiologist Miriam Nelson, Ph.D. found that test subjects that participated in strength-training increased the bone mass in their hips and lower spine by an average of about 1 percent, whereas a group of women who did not exercise lost 2 to 2.5 percent of their bone mass. Over time, that difference could make the non-exercisers 2 1/2 times more likely to suffer a debilitating fracture.<sup>14</sup>

Recent studies have also shown that strength-training can help in the fight against cholesterol, especially low-density lipoproteins (LDL), the bad type of cholesterol. One such study compared two groups of women, one group that participated in strength training and one group that participated in their normal exercise program. After 5 months their cholesterol readings were compared. The strength-trained group had significant drops in both total cholesterol and LDL cholesterol. Neither group saw any change in HDL, the beneficial cholesterol. This was the first study to show that any form of exercise can have positive effects on LDL; it had previously been thought to be resistant to exercise. Dr Boyden of the study said, "Because this is a first-time observation, the results have to be interpreted cautiously, but it does suggest potential for reducing heart-disease risk through resistance training."<sup>15</sup>

New research studies being undertaken will focus on the possibility that strength training can help prevent adult-onset diabetes, relieve arthritic symptoms and depression, and enhance the immune system in adults of all ages. It appears that we may have discovered only a small amount of the potential health benefits of strength training.

## **Flexibility Training**

Flexibility that results from stretching carries with it many benefits. Increased flexibility leads to improved physical performance with a decreased risk of injury. Recent studies have shown that stretching helps to reduce muscle soreness that can be caused by exercise. Flexibility of the hamstrings, hip flexors, quadriceps and other muscles in the pelvic region helps to reduce tension and fatigue in those regions and helps to combat low back pain. Studies have also demonstrated that stretching improves neuromuscular coordination. One of the greatest benefits of stretching is that it can

reduce stress. In fact it has been employed for thousands of years as a relaxation technique in yoga.<sup>16</sup>

Clearly it can be seen that a program of complete physical fitness will greatly benefit the individual. All these benefits to the individual can also lead to organizational benefits. Recent studies have shown that fitness programs result in decreased absenteeism, increased productivity and reduced health care costs. The financial benefits to be reaped are impressive. Recent results from large civilian corporations have shown reductions of as much as 36% in health care costs for those that exercise. Data suggests that a cost/benefit ratio of 1:1.5 to 1:1.8 can be realized from exercise programs.<sup>17</sup> In today's environment of constrained budgets, personnel drawdowns, high ops tempo and concern for rising health care costs, investment in physical fitness may be one of the best investments the US Air Force can make.

Now that we've examined the numerous benefits that can be gained from physical fitness, let's examine the history of physical fitness programs in the Air Force. Only by seeing where we have been and where we are, can we choose the appropriate path to our future.

### Notes

<sup>1</sup> David C. Nieman, *Sports Medicine Fitness Course* (Palo Alto, CA: Bull Publishing, 1986), 252.

<sup>2</sup> Ibid.

<sup>3</sup> Ibid, 253.

<sup>4</sup> Ibid, 254.

<sup>5</sup> Ibid, 265.

<sup>6</sup> Ibid, 274.

<sup>7</sup> Ibid, 277.

<sup>8</sup> Ibid, 282.

<sup>9</sup> Chad Tackett, "Benefits of Strength Training" *Bi-monthly Fitness Article*, 3; on-line, Internet, 21 January 1999, available from [http://www.global-fitness.com/a\\_strength.html](http://www.global-fitness.com/a_strength.html).

## Notes

<sup>10</sup> Ibid.

<sup>11</sup> Ibid.

<sup>12</sup> "Strength Training in the Battle Against Osteoporosis," *Women's Health Weekly*, 18 May 1998, 16.

<sup>13</sup> Greg Gutfield, "Gut Training", *Prevention*, 44, no. 9 (Sep92): 16.

<sup>14</sup> "Strength Training in the Battle Against Osteoporosis," *Women's Health Weekly*, 18 May 1998, 16.

<sup>15</sup> Greg Gutfield, "Up the Weight, Lower the Lipids", *Prevention*, 45, no. 6: 11.

<sup>16</sup> Chad Tackett, "Benefits of Flexibility Training" *Bi-monthly Fitness Article*, 3; on-line, Internet, 21 January 1999, available from [http://www.global-fitness.com/article\\_flexibility.html](http://www.global-fitness.com/article_flexibility.html).

<sup>17</sup> David C. Nieman, 27.

## **Chapter 4**

### **History of the US Air Force Physical Fitness Program**

Physical fitness has always been a concern of the military. Problems with the physical fitness of inductees were a great concern during WWI and again in WWII. The problem encountered is best summed up by a quote from General Omar Bradley who said:

“The rudest shock we experienced with the draftees was the discovery that they, the prime youth of America, were generally in appallingly poor physical condition. Some of our draftees could not walk a mile with a pack without keeling over. Most were overweight and soft as marshmallows. Only a few were capable of the hard sustained physical exertion that we knew they would experience in combat.”<sup>1</sup>

To combat this problem the Army devoted a large portion of the first 16 weeks of training to physical conditioning. This was the beginning of the physical fitness program.

The Air Force became a separate service in 1947 and published its first physical fitness regulation later that year. The regulation contained only three paragraphs. It assigned the responsibility of physical fitness of Air Force personnel to the commanders of the major commands, but was very vague as to what physical fitness was or how the program was to achieve its goals. Several insignificant changes were made to the program through out the 1940s and 1950s.<sup>2</sup>

A study of the physical fitness program was conducted by the Air Force School of Aviation Medicine in 1959. It concluded that “the overall state of physical fitness in Air

Force personnel is “poor” and that the Air Force physical fitness program, as it now stands, is ineffective.” While this program did prescribe weekly participation in physical activity, it did not set a physical fitness standard.<sup>3</sup>

In 1962 a new plan was unveiled. It was called 5BX. This program required the individual to complete 5 exercises in a given time. These 5 exercises were to be done once a day. An annual test was administered to ensure that the individual could perform at the level prescribed for his age group. Weight standards were also included in this program. Although some changes were made over the years this program remained more or less the same until 1969.<sup>4</sup>

In 1969 then Air Force Major Kenneth Cooper revolutionized exercise protocol and fitness testing in the USAF when he published a research paper on the subject in the Journal of the American Medical Association. A short time later the 1-½ mile run became the standard by which all personnel were judged. Cooper became a bit of a fitness guru in the Air Force. He was invited by Colonel John Buckner, Commandant of Squadron Officer School to evaluate the school’s program and to speak to the officers attending. This contact led to contact with Air Command and Staff College students, basic trainees and even astronauts.<sup>5</sup> Except for the reduction in the standard time allowed for completion of the run (in October 1989) the Cooper aerobic test remained the only Air Force measure of physical fitness until the adoption of the stationary bike test in October 1992. The primary reasons given for the change were that the run was not an accurate measure of fitness and that overexertion by some on the run led to several deaths per year.

As of early 1999 the Air Force physical fitness program (governed by AFI 40-501) consists of an annual submaximal cycle ergometry test. Body composition is evaluated in a separate weight management program. No measure of strength or flexibility is administered.

Is this current fitness program and test adequate for today's Air Force? Does it develop and test the overall fitness of Air Force personnel? When these questions are examined shortcomings in the program are quickly discovered.

### Notes

<sup>1</sup> Major Mark R. Forman, "Too Fat to Fight – Too Weak to Win, Soldiers' Fitness in the Future" (Army Command and General Staff College, School of Advanced Studies Monograph, 1997), 3.

<sup>2</sup> Major Charles F. Luigs, "Physical Fitness in the United States Air Force" (Research Study, Air Command and Staff College, 1972), 20-21.

<sup>3</sup> Ibid, 22.

<sup>4</sup> Ibid, 26.

<sup>5</sup> Kenneth H. Cooper, *Aerobics* (New York: Evans Publishing, 1968), 17.

## **Chapter 5**

### **Shortcomings of the Program**

Any physical fitness development and testing program will have shortcomings. Many times these shortcomings are a result of some type of necessary compromise. For example, a laboratory test (maximal effort treadmill test) is considered the best way to evaluate a subject's physical fitness; however, these tests are expensive, time-consuming and must be administered by trained personnel. For that reason some other, less reliable test may be chosen. The Air Force program seems to have shortcomings that go beyond this type of understandable level.

In the previous chapters of this paper the author has presented scientific and historical information that established what physical fitness is and what potential individual and organizational benefits are available from a good physical fitness program. In this section the information will be used to identify the shortcomings of the current Air Force program.

#### **Overemphasis on Aerobics**

As discussed in chapter 2, physical fitness is made up of four components. The Air Force only includes one of these components in their physical fitness program (body composition is included in the weight management program). Historically it can be seen how this organizational mindset developed. As discussed previously Dr. Kenneth Cooper



developed the concept of aerobics while on active duty in the Air Force. His dedication to aerobic fitness, almost to the exclusion of other types is clearly demonstrated in his book *Aerobics*, where he said:

“Muscular fitness is of some value, but is too limited. It concentrates on only one system in the body, one of the least important ones, and has limited beneficial effect on the essential organs or overall health. It’s like putting a lovely new coat of paint on an automobile that really needs an engine overall.

Endurance fitness must be your goal. It will assure all the benefits of the training effect, improving not just your muscles, but your lungs, your heart, and your blood vessels. It is the foundation on which all forms of fitness should be built.”<sup>1</sup>

Many experts in the field of fitness now believe that aerobic exercise is being given too much attention and other areas such as strength training must be considered. Eric Banister, a professor of kinesiology at Simon Fraser University in Burnaby, B.C., believes exercisers of all ages overemphasize aerobics. He recently said, "One problem is that people are all tied up with cardiovascular fitness. That is all well and good, but they neglect strength and it begins to fall off.”<sup>2</sup>

The Department of Defense agrees with physical fitness experts like Dr Fraser that strength training is important. For that reason it has been a DoD requirement since 1981 that all services strength test their members annually. The Air Force has not complied with this requirement since its inception. Although the Air Force leadership has been aware of this violation since 1993 or 1994, nothing has been done to correct the problem.<sup>3</sup> Major Jayne Stetto, USAF Chief of Health Promotions explained that while the lack of strength training in the Air Force test has been sighted in several GAO reports, the DoD does not consider it a serious problem. She added that the Air Force is currently

evaluating a new physical fitness test that will include a measurement of muscular strength and endurance.<sup>4</sup>

### **Low Aerobic Standards**

Aerobic fitness is based on the concept of maximal oxygen uptake ( $\text{VO}_2 \text{ max}$ ) which is defined as the greatest rate at which oxygen can be consumed during exercise.  $\text{VO}_2 \text{ max}$  is usually expressed as number of milliliters of oxygen consumed per kilogram of body weight per minute and reflects the overall functional capacity of the cardiorespiratory system.<sup>5</sup>

The Air Force uses the cycle ergometry or “bike test” to estimate the aerobic fitness of its personnel. Many attacks have been made on the test, but scientific evidence generally bears out its validity for estimating a subject’s  $\text{VO}_2 \text{ max}$ . The Air Force bike test’s primary shortcoming is low standards. Table 1 shows the minimum  $\text{VO}_2$  score needed by an Air Force member to meet standards and pass the test. Table 2 shows the norms for  $\text{VO}_2 \text{ max}$  as the originators of cycle ergometry, Drs. Astrand and Rhyming, defined them and table 3 shows the American Heart Association’s classifications.

**Table 1 Air Force Fitness Standards.<sup>6</sup>**

Minimum  $\text{VO}_2$  score needed to meet AF Fitness Standards

| AGE     | FEMALES | MALES |
|---------|---------|-------|
| < 24    | 27      | 35    |
| 25 – 29 | 27      | 34    |
| 30 – 34 | 27      | 32    |
| 35 – 39 | 26      | 31    |
| 40 – 44 | 26      | 30    |
| 45 – 49 | 25      | 29    |

**Table 2 Norms for VO<sub>2</sub> Max (Astrand and Rhyming).<sup>7</sup>**

| Women | Low | Fair  | Avg   | Good  | High  |
|-------|-----|-------|-------|-------|-------|
| 20-29 | <28 | 29-34 | 35-43 | 44-48 | 49-53 |
| 30-39 | <27 | 28-33 | 34-41 | 42-47 | 48-52 |
| 40-49 | <25 | 26-31 | 32-40 | 41-45 | 46-50 |
| Men   | Low | Fair  | Avg   | Good  | High  |
| 20-29 | <38 | 39-43 | 44-51 | 52-56 | 57-62 |
| 30-39 | <34 | 35-39 | 40-47 | 48-51 | 52-57 |
| 40-49 | <30 | 31-35 | 36-43 | 44-47 | 48-53 |

**Table 3 Cardiovascular Fitness Classifications (American Heart Association).<sup>8</sup>**

| Women | Low | Fair  | Avg   | Good  | High |
|-------|-----|-------|-------|-------|------|
| 20-29 | <24 | 24-30 | 31-37 | 38-48 | 49+  |
| 30-39 | <20 | 20-27 | 28-33 | 34-44 | 45+  |
| 40-49 | <17 | 17-23 | 24-30 | 31-41 | 42+  |
| Men   | Low | Fair  | Avg   | Good  | High |
| 20-29 | <25 | 25-33 | 34-42 | 43-52 | 53+  |
| 30-39 | <23 | 23-30 | 31-38 | 39-48 | 49+  |
| 40-49 | <20 | 20-26 | 27-35 | 36-44 | 45+  |

If we compare the Air Force standards to the Astrand-Rhyming norms one can see that a 25-year old male could pass the Air Force test with a score of 34. That score would place the Air Force member in the “low” category and he would need to improve his score nearly 10 points to reach an “average” level on the norms chart. If the American Heart Association classifications were used this individual would rank at the lower end of the average category. According to a recent *Air Force Times* article to flunk the bike test a subject would have to score lower than 80% of the general US population.<sup>9</sup>

Another indication of the less than rigorous standards of the Air Force program involves a comparison of the bike test and the 1.5-mile run test. The 1.5-mile run test estimates VO<sub>2</sub> max from the time required to complete the run. In order for a 25-year old

subject to score a 34 on this test (the passing standard for the bike test) he would only need to complete the 1.5 mile run in a time of 15:30 (min:sec).<sup>10</sup> If one compares this standard to the Navy standard of 13:45 and the previous Air Force run standard of 12:30, the current Air Force standards appear to be quite low.

Why are the standards set so low? According to Major Jayne Stetto, USAF Chief of Preventive Medicine, the standards were set for the introduction of the bike test in 1992. The method used involved selecting a cross section of the Air Force that included an array of personnel from elite athletes to “couch potatoes.” These individuals were given the bike test and the standard was established at the 30<sup>th</sup> percentile. In layman’s terms this means that the standard was set so that 70% of Air Force members could pass the test without improving their fitness level at the time. Major Stetto explained that the Air Force wanted to encourage physical activity and fitness in order to gain health and wellness benefits, but did not want to push people to a point where injuries would occur.<sup>11</sup> No research was done to decide if the level of fitness needed to pass the bike test was high enough to actually produce these effects, or if raising the standards would have significantly raised the rate of injury in Air Force personnel.

### **A Test, Not a Program**

The Air Force fitness program is governed by AFI 40-501. This AFI is 38 pages long, but the majority of those pages are devoted to administrative details related to the bike test. The lack of emphasis placed on providing a physical fitness training program is clearly demonstrated by a statement on page 3 of the document:

Members are given the information needed to develop physical conditioning programs and are expected to maintain an adequate level of physical fitness at all times.<sup>12</sup>

The only other information contained in the AFI that is not related to the bike test comes in paragraph 3.2.2, WHEN BRIEF GUIDELINES FOR MODE OF ACTIVITY, INTENSITY, DURATION AND FREQUENCY OF EXERCISE ARE GIVEN.<sup>13</sup>

### **No Mandatory Participation**

While participation in annual testing is required by AFI 40-501, participation in regular exercise is not required. The implied assumption is that as long as a member can pass the annual cycle ergometry test, then the Air Force standard of physical fitness has been achieved. This approach to fitness is unique among the services. Marines have a mandatory 3 hours of physical training per week and Army units routinely participate in physical training. Informal interviews with Army personnel attending Air Command and Staff College during AY 1999 confirmed that mandatory participation in physical training is the norm for Army personnel. Furthermore, they confirmed that this mandatory participation sufficiently prepared personnel for semiannual physical fitness testing and kept soldiers in shape year-round.

### **Predictable Testing**

While the Army and Marine programs of mandatory participation and semiannual testing help to ensure the year-round fitness of soldiers and marines, the predictability of annual bike tests is more conducive to a “prepare for the test and then relax for the rest of the year” approach. For years the Air Force has recognized this phenomena in other areas of the mission. For example, aircrews and missile crews are often given no-notice checkrides, personnel are randomly weighed as part of the weight management program

and some inspections are done on a no-notice basis. There is no reason to believe that the same type of system is not necessary in the physical fitness program.

### **Pass Fail Scoring**

Unlike the other services, the Air Force fitness test is scored on a pass/fail basis. While members of other services strive to maintain or improve their level of fitness as assessed by their test score, the pass fail system of the Air Force encourages a less than ambitious attitude toward physical fitness. Informal interviews with US Army officers support the fact that most Army personnel are concerned about their physical fitness test score and they strive to improve it. Physical fitness scores also weigh to some extent in the career progression of Army personnel. This fact also leads to a more ambitious attitude toward physical fitness.

### **Conclusion**

In the author's opinion the Air Force currently has a physical fitness program that is concerned primarily with the administration of a fitness test rather than assuring the management of a fitness program. Other than annual testing, there is no mandatory participation required of Air Force members. This test is given at predictable times, measures only one component of fitness, has less than rigorous standards for passing and is graded only on a pass/fail basis. Most significantly this test is in direct violation of DoD policy and has been for nearly 20 years. Clearly this physical fitness program is not adequate to meet the current and future needs of the Air Force. It needs a new physical fitness program that addresses all the concerns enumerated in this section. Only by

overcoming these shortcomings can the Air Force forge the type of fitness program that will yield the significant benefits desired.

### Notes

<sup>1</sup> Kenneth H. Cooper, *Aerobics* (New York: Evans Publishing, 1968), 29.

<sup>2</sup> Sharon D. Driedger, *Maclean's*, 110, no. 12: 60.

<sup>3</sup> William Matthews, "Air Force Fitness Standards are Getting Tougher", *Air Force Times*, 10 August 1998, 12.

<sup>4</sup> Major Jayne Stetto, USAF Chief of Health Promotions, interviewed by author, 12 March 1999.

<sup>5</sup> David C. Nieman, *Sports Medicine Fitness Course* (Palo Alto, CA: Bull Publishing, 1986), 56.

<sup>6</sup> Air Force Instruction 40-501, *The Air Force Fitness Program*, 1 October 98, 21.

<sup>7</sup> David C. Nieman, 366.

<sup>8</sup> Vivian H. Heyward, *Advanced Fitness Assessment and Exercise Prescription* (Champaign, IL: Burgess Publishing, 1991), 26.

<sup>9</sup> William Matthews, "Air Force Fitness Standards are Getting Tougher", *Air Force Times*, 10 August 1998, 12.

<sup>10</sup> David C. Nieman, 365.

<sup>11</sup> Major Jayne Stetto, USAF Chief of Health Promotions, interviewed by author, 12 March 1999.

<sup>12</sup> Air Force Instruction 40-501, 4.

<sup>13</sup> *Ibid.*, 16.

## **Chapter 6**

### **Suggestions for a New and Improved Program**

Just as any good military plan must consider the desired endstate, so must a new Air Force physical fitness program. The desired endstate is an Air Force where every member and therefore the organization as a whole enjoys the benefits of all components of physical fitness. This endstate can be achieved through a well-developed and implemented physical fitness program. This program can be divided into two phases – training and testing.

#### **The Physical Fitness Training Program**

The first cornerstone of this new program will be education and supervision of initial workouts. It is important that all members understand and fully participate in the program. Once this task is accomplished they can continue participation with little or no supervision.

The second cornerstone is mandatory participation in not only physical fitness testing, but also physical fitness training. Most other services require members to be present for group physical training, but the Air Force has historically taken a more individualized approach. This new program will continue that tradition with a slight modification. Each Air Force member will be required to perform and document three



total workouts each week. Approximate duration of workouts should be one to one and a half hours, or three to four and a half hours per week.

These three workouts per week will include training for strength, flexibility and aerobic fitness. Each will use the five-stage approach outlined below<sup>1</sup>:

1. Warm-up – Before any hard exercise is undertaken the member should engage in some slow aerobic activity. This will slowly raise the heart rate, increase blood flow and prepare the body for more vigorous exercise. No stretching should be performed before this warm-up since injury could occur. This activity should take approximately 5 minutes.
2. Aerobic Activity – the next activity will be aerobic training at 60-90% of maximal capacity for 15-60 minutes. Different modes of training such as swimming, running, cycling, etc. should be used to add variety to the program. Time and intensity can be increased as the subject's aerobic fitness level improves.
3. Warm-down – a period of slow aerobics should occur at the end of aerobic activity. This will allow for a gradual decrease in heart rate and enhance recovery. This activity should take 3-5 minutes.
4. Flexibility - Stretching should be done after the aerobic activity while muscles are warm. Static stretching is recommended and each stretch should be held for 15-30 seconds and repeated twice. Specific stretches will be included in program education. This activity should take 5-10 minutes.
5. Muscular Strength and Endurance Training – The final stage of the workout will involve weight lifting. A program of upper and lower body exercises will be

done. Initial workouts will be one set of 10-12 repetitions for each major muscle group. As fitness improves subjects will increase their workout to three sets of 10-12 repetitions and increase weight as needed to perform 10-12 repetitions with perceived moderate exertion. Examples of muscle groups and corresponding exercises are: chest - bench press, shoulders – military press, pull-downs – back, push-downs – triceps, curls – biceps, leg press – upper legs, toe raises – calves, leg curls – back of legs and sit-ups or crunches – abdominals. Education on these exercises would be provided to the member during program initiation.

What can personnel do if they are deployed or in a location without gym facilities? These workouts can still be accomplished even if gym facilities are not available. Exercises such as walking, running, stair climbing, or rope jumping can be accomplished to meet aerobic training requirements and calisthenics can be used to fulfill muscular strength and endurance training requirements.

The establishment of this new program will accomplish two main objectives. First, the mandatory participation ensures that Air Force personnel are not only physically fit for annual testing, but also physically fit for duty year-round. The author also believes that making physical training mandatory will, over time, result in a change in organizational attitude toward physical fitness. Physical training will come to be viewed as a duty that must be accomplished on a regular basis, rather than an activity to be done on a time available basis. This change in attitude should help to combat the excuse used by many personnel that they just don't have time for physical training.

The second objective met by this new program is to remove the Air Force's overemphasis on aerobics and establish a more rounded approach toward physical fitness. The fact that aerobics, muscle strength and endurance, and flexibility training are accomplished during each workout assures that each individual is maximizing his or her potential to enjoy all the fitness benefits described in chapter 3 and that the organization will benefit as well.

### **The Physical Fitness Testing Program**

The US Air Force and its members need to have a physical fitness test for a number of reasons. Some of these reasons include (1) the DoD requires the Air Force to test its members (2) the Air Force wants to evaluate the physical readiness of its forces (3) each member of the Air Force wants to evaluate his or her personnel fitness level and make adjustments in their training.

This test should include certain elements in order to meet the needs of the individual, the Air Force and the DoD. In order to meet the needs of the individual it should be a test that assigns a numerical score to performance rather than just a pass/fail determination. For example the Army, Navy and Marine physical fitness tests assign a numerical score that better allows the member to evaluate his or her fitness level. As discussed previously this type of score seems to illicit a more ambitious approach to fitness than a pass/fail type scoring system.

In order to meet Air Force and DoD requirements this test will have to be given annually. No-notice tests should be included in the program as well. This no-notice system will ensure that all members maintain their fitness levels throughout the year and not just in preparation for the scheduled test. As discussed previously, this feature of the

program will parallel that of other no-notice evaluations such as those administered to aircrews or used in the weight management program.

Finally to meet DoD requirements and to ensure that all Air Force members are totally fit, the test must assess all four components of physical fitness. The bike test can be used to assess aerobic fitness, however standards should be raised. The minimum passing score will correspond to the lowest value in the average category of the norms for VO<sub>2</sub> max (table 2, page 19). Higher numeric scores will be assigned for each higher VO<sub>2</sub> level achieved.

**Table 4 Norms for Muscular Strength and Endurance Testing <sup>2</sup>**

| Weight Lift | % Body Weight |
|-------------|---------------|
| Bench Press | 67%           |
| Arm Curl    | 33%           |
| Lat Pull    | 67%           |
| Quad Lift   | 67%           |
| Leg Curl    | 33%           |

After determining weight to be lifted, subject is to do as many repetitions as possible until exhaustion. Norms are as follows:

|           |         |       |
|-----------|---------|-------|
| Excellent | Males   | 17+   |
|           | Females | 15+   |
| Good      | Males   | 12-16 |
|           | Females | 11-14 |
| Average   | Males   | 9-11  |
|           | Females | 8-10  |
| Below Avg | Males   | <9    |
|           | Females | <8    |

Muscular strength and endurance can be assessed in a number of ways. The first option would be to benchmark the Army or Navy system and use a 2-minute push-up

drill. A minimum standard would be set and additional points would be earned for exceeding the standard. An alternative to this procedure would be to use selected weight lifting exercises to evaluate the strength of several major muscle groups. Table 4 shows the exercises, the weight to be lifted and the assessment system. For example a 180-pound man would have 67% of his body weight, or 120 pounds placed on the bar and perform repetitions to exhaustion. A numerical score could then be assigned based on the number of repetitions performed. This test could be repeated with other major muscle groups. This test would be more involved and time consuming, but would provide a more valid assessment of muscle strength and endurance.

The flexibility component of fitness will be assessed with the sit and reach test. The sit and reach test is one of the most universally used and easily administered flexibility tests. The subject sits on the floor with legs straight out in front. He or she then reaches out as far as possible. Scores will be assigned based on the distance reached relative to the toes. Higher scores will be assigned for reaching closer to or beyond the toes.

Finally the member's body composition should be assessed. Currently this is done in the Air Force weight management program, but since it is one of the four components of fitness, the author proposes it be included in the physical fitness test. Since regular exercise should improve members' body composition, this test can provide valuable feedback to the individual. The current Air Force method is acceptable, but a more accurate method such as multiple site caliper tests is recommended. The caliper method of testing is relatively easy to administer and will give results superior to the current method.

## Notes

<sup>1</sup> David C. Nieman, *Sports Medicine Fitness Course* (Palo Alto, CA: Bull Publishing, 1986), 200-201.

<sup>2</sup> David C. Nieman, 372.

## **Chapter 7**

### **Conclusion**

Physical fitness is an important issue for the Air Force organization and every member. Participation in regular exercise carries with it many health benefits for the individual and therefore benefits the service as a whole. In these days of high ops tempo, limited health care budgets and concerns with readiness, a well thought out and well run physical fitness program could pay big dividends. The current program is clearly inadequate to get the Air Force from its current position to the desired endstate. In order for the Air Force to capitalize on the multitude of opportunities available from a top-notch fitness program it must completely revamp its substandard program. It is the author's sincere hope that the program outlined in chapter 6 will be instituted in the near future.

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